VP-ReID: Vehicle and Person Re-Identification System

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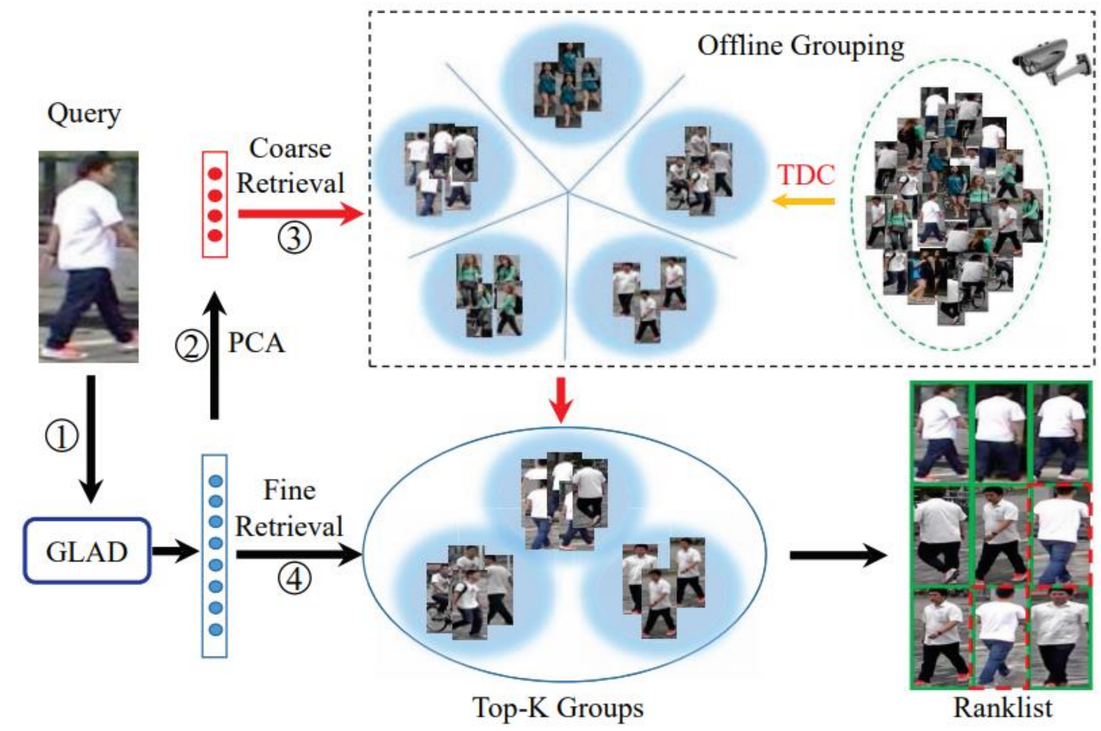
Abstract

Person Re-Identification (ReID) and vehicle ReID are the key technology in smart surveillance system. We develop a robust and efficient ReID system, named VP-ReID, to demonstrate our recent research progresses on those two tasks. This system is build based on our recent works including discriminative feature design and efficient off-line indexing. Constructed upon those algorithms, VP-ReID can identify vehicle and person efficiently and accurately from large gallery set.

Person Re-Identification:

Offline Grouping and Online Retrieval

- First offline clusters similar images into same group
- Images in returned groups are retrieved with original GLAD to generate an image rank list.

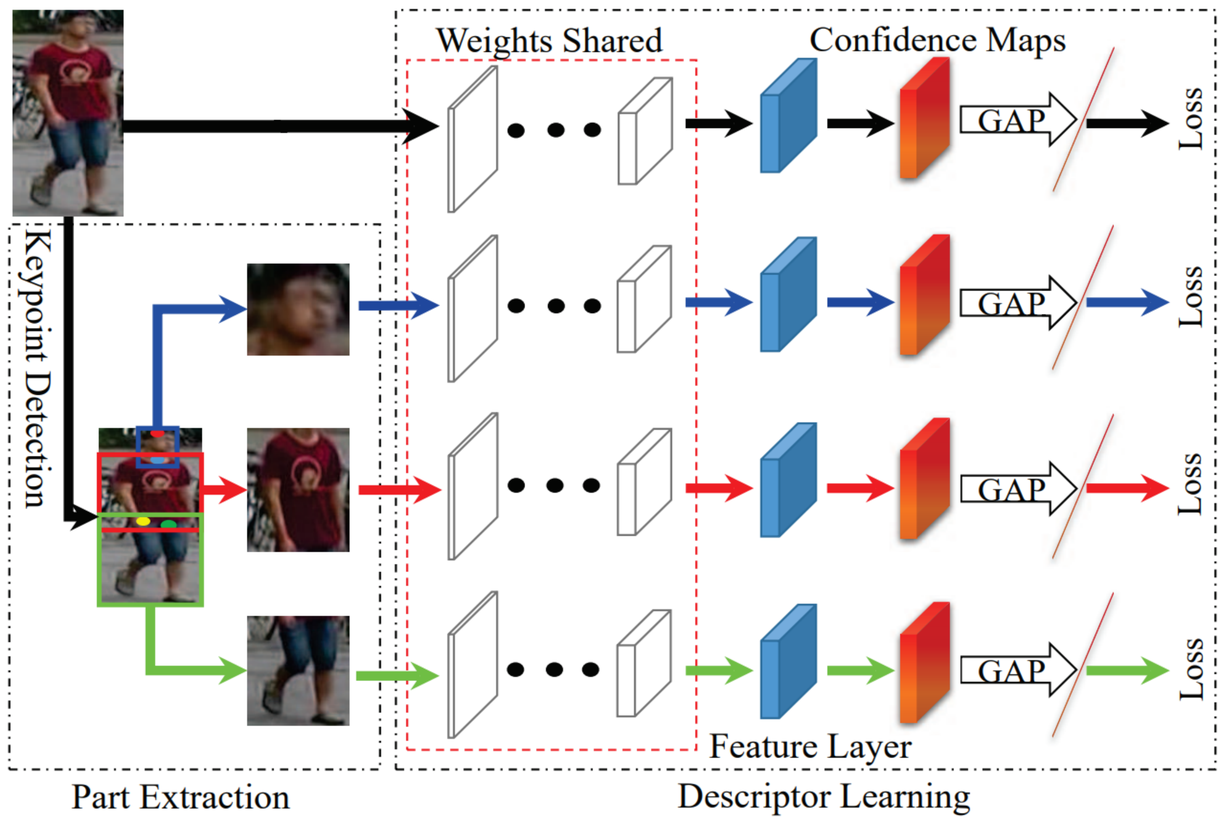


Re-ID Efficiency on *Market1501*

θ	Group Number	Dim	mAP	Rank-1	Times(ms)
0.0000	19732	4096	73.9	89.9	368
0.0010	13509	4096	73.7	89.9	267
0.0015	**8509**	**4096**	**73.2**	**89.9**	**176**
0.0020	2558	4096	71.7	89.8	101
0.0015	8509	512	73.1	89.9	50
0.0015	8509	128	73.0	89.8	31
0.0020	2558	512	71.6	89.7	69
0.0020	2558	128	71.4	89.7	61

GLAD Descriptor

- GLAD explicitly leverages local and global cues to generate a discriminative and robust representation
- Learn complementary features on both coarse-grained local parts and global regions
- The matching of local representation can effectively handle the misalignment and pose change issues



Comparison with Related Works

On *Market1501*

Methods	mAP	Rank-1
BoW+Kissme [54]	20.8	44.4
WARCA [13]	-	45.2
LOMO+XQDA [14]	22.2	43.8
Null Space [15]	35.7	61.0
SCSP [60]	26.4	51.9
PersonNet [11]	26.4	37.2
Gated Siamese [61]	39.6	65.9
LSTM Siamese [62]	35.3	61.6
DLCNN [19]	59.9	79.5
PIE [18]	56.0	79.3
Spindle [39]	-	76.9
MSCAN [29]	57.5	80.3
DLPAR [41]	63.4	81.0
SVDNet [23]	62.1	82.3
PAN [26]	63.4	82.8
DML [63]	68.8	87.7
GLAD	**73.9**	**89.9**
GLAD+re-Rank [53]	**87.1**	**91.2**

On *DukeMTMC-ReID*

Methods	mAP	Rank-1
APR [64]	51.9	70.7
SVDNet [23]	56.8	76.7
PAN [26]	51.5	71.6
ACRN [65]	52.0	72.6
DPFL [30]	60.6	79.2
GLAD	**62.2**	**80.0**
GLAD+re-Rank [53]	**79.3**	**84.4**

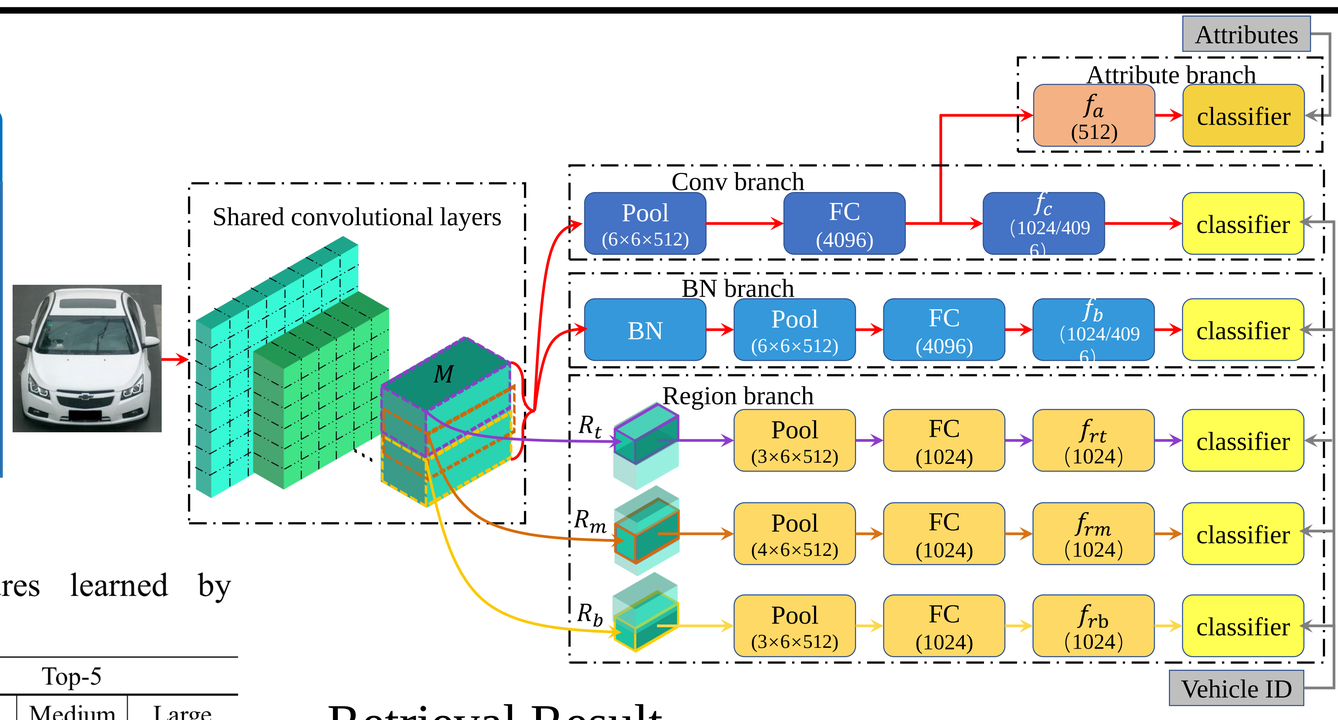
On *CUHK03*

Methods	Rank-1	Rank-5	Rank-10
MLAPG [19]	58.0	87.1	94.7
Null Space [41]	62.6	90.1	94.8
PersonNet [36]	64.8	89.4	94.9
Improved Deep [1]	54.7	86.5	93.9
DGD [38]	72.6	91.6	95.2
Baseline	74.4	95.4	97.9
GLAD	**85.0**	**97.9**	**99.1**

Vehicle Re-Identification:

Region-Aware deep Model (RAM)

- We propose a Region-Aware deep Model (RAM) to jointly learn global and regional features.
- Attribute cues are additionally used to jointly train RAM.
- Learned features are more discriminative to detailed local cues, and contains attribute cues.



Experimental Results

1. Performance comparison of features learned by different models on *VeRi*.

Models	mAP	Top-1	Top-5
Baseline	0.550	0.848	0.931
BN	0.581	0.871	0.940
BN+R	0.609	0.887	0.941
RAM	**0.615**	**0.886**	**0.940**

2. Performance comparison of features learned by different models on *VehicleID*.

Models	Top-1			Top-5		
	Small	Medium	Large	Small	Medium	Large
Baseline	0.694	0.673	0.632	0.892	0.820	0.795
BN	0.722	0.705	0.666	0.904	0.853	0.832
BN+R	0.747	0.720	0.674	0.908	0.863	0.842
RAM	**0.752**	**0.723**	**0.677**	**0.915**	**0.870**	**0.845**

3. Comparison with recent works on *VeRi*.

Models	mAP	Top-1	Top-5
FACT[Liu, ICME2016]	0.199	0.597	0.753
FPSS[Liu, ECCV2016]	0.278	0.614	0.788
SCPL[Shen, ICCV2017]	0.583	0.835	0.900
OIF[Wang, ICCV2017]	0.480	0.659	0.877
OIF+SF[Wang, ICCV2017]	0.514	0.683	0.897
RAM	**0.615**	**0.886**	**0.940**

4. Comparison with recent works on *VehicleID*.

Models	Top-1			Top-5		
	Small	Medium	Large	Small	Medium	Large
VGGT[Liu, CVPR2016]	0.404	0.354	0.319	0.617	0.546	0.503
CCL[Liu, CVPR2016]	0.436	0.370	0.329	0.642	0.571	0.533
MDCCL[Liu, CVPR2016]	0.490	0.428	0.382	0.735	0.668	0.616
OIF[Wang, ICCV2017]	-	-	0.670	-	-	0.829
RAM	**0.752**	**0.723**	**0.677**	**0.915**	**0.870**	**0.845**

Retrieval Result